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solutions for your environment



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GW182



11 December 2009

Steve Wilkes APL Resource Management PO Box 185 **BLENHIEM 7240**

Dear Steve

OYSTER BAY PUMP TEST

This letter provides a summary of our analysis of the recent pump test carried out on the new Oyster Bay bore by John Butt. The bore was drilled in September 2009, and is located approximately 7 m to the east of Gibson's Creek, and 800 m to the south of the Wairau River. The bore and the test monitoring bores are marked in Figure 1.

General Hydrogeological Setting

The bore is drilled in the permeable gravels of the Wairau Aquifer. Well depths in this area have typically been less than 20 m deep which have been sufficient for most users to obtain productive well yields. These high yields are, in part due to the very permeable nature of the gravel strata and in part due to the proximity of the Wairau River. Gauging surveys along the river indicate that during stable, low flow conditions it loses seepage at a rate of around 7-8 m³/s between the Waihopai River confluence and Giffords Road – a distance of around 14 kilometres.

In 1988, Marlborough District Council undertook a detailed gauging and piezometric survey along this stretch of the Wairau River and the adjoining Plains. The data was re-analysed in PDP (2001) to provide an indication of the hydraulic conductivity of the river bed. This assessment suggests a hydraulic conductivity of the river bed in the range from 1-400 m/day (assuming a 100 m wide channel width at times of stable low flow). This corresponds to a bed conductance of 100-40,000 m/day (assuming a 1 m bed thickness) as defined in the "Guidelines for the Assessment of Groundwater Abstraction Effects on Stream Flow" (ECan, 2000). While this is a wide range of estimates, ECan (2000) note that streambed conductance values greater than 10 m/day generally indicate a very high degree of hydraulic connection between a stream and an aquifer.

This recharge from the Wairau River helps to maintain relatively stable shallow groundwater levels within the aquifer. MDC have a long-term monitoring well at Conders Bend (well reference number P28w/398) which fluctuates within a range of 4 m from around 2-6 m below ground level. Lower water levels coincide with summer months of low river flow and increased groundwater abstraction.

The characteristics of a permeable gravel aquifer and bounded by a large river recharge source make the Conders Bend area of the Wairau aquifer a productive water resource for abstractive purposes.



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OYSTER BAY PUMP TEST

Description of Test

A three day constant rate test was carried out by Butt Drilling in November 2009: the bore was pumped at an average rate of 62.52 L/s (5402 m³/day) between 17:52 on 6 November 2009 and 18:05 on 9 November 2009. Changes in water level were monitored using data loggers in the pumped bore and in four observation bores. The location of these bores is shown in Figure 1. The water from the pumping test was discharged into Gibson's Creek.

Details of the aquifer test bores are summarised in Table 1.

Table 1: Details of	of Pumped and	Observation	Bores					
Description	MDC Well Number	Easting	Northing	Screen Depth (m)	Bore Diameter (mm)	Distance from Pumped Bore (m)	Direction from Pumped Bore	SWL Prior to Pumping (m below toc)
Pumped bore	Not recorded	2575318	5967390	26.01-29.01	300		-	4.92
Well across creek	P28w/3162	2575305	5967390	16.51-19.51	200	13	West	
Cloudy Bay	P28w/3161	2575491	5967401	17.3-20.3	200	173	East	4.69
Montana	P28w/0900	2575332	5967634	4.881	50	244	North	4.36
Delegat Irrigation	P28w/3160	2575321	5967118	14.85-17.85	200	272	South	4.30

Drillers Logs

The driller's logs for the bores used during this test are attached to this letter. The driller's log for P28w/3162 indicates the existence of a water bearing unit between 5.1 and 11.2 m below ground level consisting of sand, gravel and clay. This is overlain silty topsoil to a depth of 0.6 m, sand between 0.6 and 1.1 m and a lower permeability layer consisting of tight gravel, sand and clay. Between 11.2 and 16.1 m the stratum consists of tight sand and gravels and is described as poor water bearing. The second water bearing unit between 16.1 and 19.8 m consists of gravel and clay. The driller observed no difference in water levels between the shallow water bearing gravels and the deeper gravels where the bore is screened.

The log for P28w/3161 indicates the presence of a water bearing unit between 9.1 and 12.0 m consisting of sand, gravel and clay. This is overlain by silty top soil to 0.3 m and strata consisting of poorly sorted gravels or tight gravel, sand and clay to 9.1 m. Between 12 and 17.1 m the stratum consists of tight sand and gravels and is described as poor water bearing. The second water bearing unit between 17.1 and 21.1 m consists of gravel and clay.

The log for P28w/3160 indicates the presence of water bearing gravels mixed with clay between 12.9 and 18.4 m. This is overlain by variable strata consisting mainly of gravels, sand and clay.

The log for the new bore indicates the presence of several water bearing units between 9.4 and 14.4 m, 16.1 and 17.9 m, 20.1 and 21.1 m and between 22 and 28.5 m below ground level. These water bearing units are mixed with sand and clay and are separated by lower permeability strata consisting of clay bound cobbles, gravels and sands.



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OYSTER BAY PUMP TEST

Based on the general description of the hydrogeological setting and details from the drillers logs it can be inferred that the pumped bore is screened in a water bearing unit separated from shallower water bearing gravels by lower permeability strata.

Test Data and Estimation of Effects on Neighbouring Bores

Figure 2 shows changes in water levels in the pumped and monitoring bores through the monitoring period. The data indicates that the pumped well rapidly achieved a steady drawdown of around 4 m. The drawdown in the monitoring bores is considerably smaller and the absence of a full water level recovery in the bores P28w/3161 and P28w/3162 indicates that a background declining trend was occurring during the test. Therefore, the drawdown in bore P28w/3161 is likely to be of the order of 0.18 m, and for bore P28w/3162 is likely to be of the order of 0.2 m, assuming a linear background trend between the start of pumping and the end of the observation period. No clear drawdown is apparent in bores P28w/0900 and P28w/3160 where the changes in water level may simply be background water level changes.

Bores P28w/3162 and P28w/3161 were assumed to be screened in the same aquifer as the pumped bore. Figures 3a and 3b show a solution for a permeable aquifer with a low storage capacity that receives seepage from a nearby stream fitted to the inferred drawdown in these bores. It is recognised that the inferred drawdown is approximate, although the drawdown pattern displays the characteristics of a high transmissivity aquifer adjacent to a plentiful recharge source (i.e. Gibsons Creek and/or the Wairau River). This could cause the rapid drawdown response followed by a flattening of the drawdown curve. The following parameters have been used to obtain the model fits shown in Figures 3a and 3b:

Table 2: Estimates of Aquifer Par	ameters	
Parameter	P28w/3162	P28w/3161
Transmissivity (m²/day)	9,500	11,000
Storage Coefficient	0.004	0.0007
Leakage (1/day)	0.45	0.01
Specific Yield	0.15	0.007
Streambed conductance m/day	100	10

Due to the uncertainty about the inferred drawdown pattern these parameters have an associated degree of uncertainty. However, the drawdown pattern indicates that the effect of this abstraction on neighbouring bores is very small (drawdown effects of less than 0.2 m). The reason for this is the highly permeable nature of the strata and the proximity to a surface water recharge source.

Limitations

This letter provides an analysis of a 3 day constant rate pump test carried out on a new bore on the Delegat property, using data that has not been independently verified by Pattle Delamore Partners. This data was adjusted to take into account a background trend inferred from the pattern of pre-test and post-test monitoring.

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OYSTER BAY PUMP TEST

We hope you find these comments useful. Should you require any further information please do not hesitate to contact me.

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Yours sincerely

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PATTLE DELAMORE PARTNERS LIMITED

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Nicholas Ward

Reference

Pattle Delamore Partners, 2001, Assessment of Effects of Proposed Abstractions at Upper Condors Bend.

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DELEGAT'S PUMP TEST

We hope you find these comments useful. Should you require any further information please do not hesitate to contact me.

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Yours sincerely

PATTLE DELAMORE PARTNERS LIMITED

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Nicholas Ward

Reference

Pattle Delamore Partners, 2001, Assessment of Effects of Proposed Abstractions at Upper Condors Bend.

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		V	VATI	ER WELL ENGINEERS TO MAR	RLBOROUGH
Log Well Own	No 1308 er Delegat P.O.Box Blenheir	's Wine Estate 305 n	;	Contact Name Bala	
Driller Ro Drilling Da Locality Up	b Millard te 04/09/200 pper Renwick	19 Grið ref 25'	75322-596	Map Sheet No Altitude (m): Grid Ref East: South	
Depth T Top (m)	o Strata Bottom (m)	Strata Thickness (m)	Static Level (m)	Strata Description	Strata Pinture
0.00	0.30	0.30		Brown stoney topsoil	
0.30	9.40	9.10		Grey coarse gravels to fine sand	
9.40	14.40	5.00	******	Brown and grey coarse gravel, some yellow clay, water bearing	
14.40	16.10	1.70		Grey coarse gravels, tan clay bound	
16.10	17.90	1.80	E	Brown and grey cobble to medium sand, some yellow clay, water bearing	
17.90	20.10	2.20	0	Grey coarse gravels, tan clay bound	
20.10	21.10	1.00	e	frown and grey coarse gravel, some yellow clay, water bearing	
21.10	22.00	0.90	G	rey cobble to medium sand, yellow clay bound	
22.00	25.40	3.40	B	rown and grey cobble to medium sand, some yellow clay, poor water	
25.40	28.50	3.10	Bibe	rown and grey cobble to medium sand, some yellow clay, good water	
28.50	31.20	2.70	Br	own and grey cobble to medium sand, yellow clay bound	
					Acc

9/12/2009 9:58:24 p.m.

Page 1 of 2



02/10/2008 04:23 035788166	PAGE 03/03
4 Springswood Grove BLENHEIM Telephone 021-343 089 After hours 0-3-578 8166 Facsimile 0-3-578 8166	
WATER WELL ENGINEEDS	
Finished Static Water Level: 4 70	IO MARLBOROUGH
Test Pumping: 2,50 Hours	Ground Level
Draw Down (m): 3.30 Below Static Water Level Scre	en NB Dia
Flow Rate: 223.8 cubic mph Top of Screen Leader (m): 25 50): 300 Leader Length
Step Test By: Top Of Screen (m): 26.01	(m): 0.42 Casing Length
No: 1 Screen Type SS wedge wire 26.01 29.01 4.00 3.00	(m): 26.01
Remarks: Bottom Of Screen (m): 29.01 Length of Sump (m): 0.79	Total Screen Length (m): 3.00
Flanged ready for pump install.	of Well (m): 29.80
-7	
PLEASE NOTE: Test pumping flow rates, static levels, and water level draw down are as recorded at th figures could change at a later time due to influences beyond our control (e.g. seasons	e time of test pumping. These Il variations).
9/12/2009 9:58·24 mm	
	Page 2 of 2

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9 Aston Street BLENHEIM Telephone 021-343 089 After hours 0-3-578 8270 Facsimile 0-3-578 8166



WATER WELL ENGINEERS TO MARLBOROUGH

WELL OWNER Whickham Developments Ltd

ADDRESS P.O.Box 3193 Auckland

Well Production 2

DRILLING DATE July 97

MACHINE No 3 Cable tool

LOCALITY Upper Renwick

GRID REFERENCE

N.Z.G.S.WELL No

P28W/3160

P28: 2575317 - 5967119

PERMIT NO

REDUCED LEVEL OF WELLSITE (m above mean sea level)

MATERIALS ENCOUNTED

0-.5 top soils & big gravals .5-8.5 clean poorly sorted gravals 8.5-12.1 yellow clays & gravals 12.1- 12.9 yellow clays & sand 12.9-18.4 water bearing gravals , yellow clays

STATIC WATER LEVEL 4.94

CASING DIAMETER 200mm LENGTH 14.85

SCREEN TYPE 200 mm SS wedge wire SET AT 14.85-17.85 (3 m.)

SLOT SIZE 2.5 mm DRAW DOWN 1.88

AFTER 2 HOURS PUMPING AT 20.4 LITRES / SEC

REMARKS Production 2 see draw down test

 $Q/s = \frac{73.44 \text{ m}^3/\text{hour}}{1.88 \text{ metres}}$ $= 39.1 \text{ m}^3/\text{hour}/\text{metre}$ drawdown.





9 Aston Street BLENHEIM Telephone 021-343 089 After hours 0-3-578 8270 Facsimile 0-3-578 8166



WATER WELL ENGINEERS TO MARLBOROUGH

WELL OWNER Wickham Developments Ltd

ADDRESS P.O.Box 3193 Auckland

Well Production 3-

DRILLING DATE July 97

MACHINE No 3 Cable tool

LOCALITY Upper Renwick

GRID REFERENCE

N.Z.G.S.WELL No

P28W/3161

P28: 2575488 -5967399

PERMIT NO

REDUCED LEVEL OF WELLSITE (m above mean sea level)

MATERIALS ENCOUNTED

0-.3 silty top soils .3-6.5 poorly sorted gravals 6.5-9.1 Tight graval, sand and yellow clay 9.1-12.0 sand graval & clay w/b swl approx 5.6mtr 12-17.1 sand , gravals , tight pwb 17.1- 21.1 gravals & yellow clays w/b

STATIC WATER LEVEL 5,60

CASING DIAMETER 200mm LENGTH 17.3

SCREEN TYPE 200 mm SS wedge wire SET AT 17.3-20.3 (3 m.)

SLOT SIZE 2.5 mm DRAW DOWN 1.76

AFTER

48 HOURS PUMPING AT 20.3LITRES / SEC

REMARKS Production 3 see draw down test

 $Q_{S} = \frac{73.08 \text{ m}^{3}/\text{hour}}{1.76 \text{ methes}}$ = 41.5 m³/hour/metic drawdown.





9 Aston Street BLENHEIM Telephone 021-343 089 After hours 0-3-578 8270 Facsimile 0-3-578 8166



WATER WELL ENGINEERS TO MARLBOROUGH

WELL OWNER Wickham Developments Ltd

ADDRESS P.O.Box 3193 Auckland

Well Production 4

DRILLING DATE August 97

MACHINE No 3 Cable tool

LOCALITY Upper Renwick

P28: 2575301 - 5967386

GRID REFERENCE

N.Z.G.S.WELL NO

P28w/3162

PERMIT No

REDUCED LEVEL OF WELLSITE (m above mean sea level)

MATERIALS ENCOUNTED

0-.6 silty top soils .6-1.1 sand 1.1-5.1 Tight graval, sand and yellow clay 5.1-11.2 sand graval & clay w/b swl approx 6.0mtr 11.2-16.1 sand , gravals ,tight pwb 16.1-19.8 gravals & yellow clays w/b

STATIC WATER LEVEL 5.86 CASING DIAMETER 200mm LENGTH 16.51 SCREEN TYPE 200 mm SS wedge wire SET AT 16.51-19.51 (3 m.)

SLOT SIZE 2.5 mm DRAW DOWN 0.68

AFTER 48 HOURS PUMPING AT 22.3 LITRES / SEC

REMARKS

Production 4 see draw down test

 $Q'_{S} = \frac{80 \cdot 28 \text{ m}^{3}/\text{hour}}{0.68 \text{ metrcs}}$ $= 118.1 \text{ m}^{3}/\text{hour}/\text{metrc}$ drawdown.



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Owner or User: ER.C.	Hord	Addres	s: lonciers	Bend.
U Driller:			Date:	
Recorded by:LIR	Date: <u>_1</u>	13/6/66	Source of Information_	Visit
Type Driven Total	Depth 16t	Meas'd Rept'd:]	Diameter:	2 ins Meas'd Rept'd
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Use of Water	Quality_		Anglysis (on File $\frac{\text{Yes}}{\text{No.}}$
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